Northeastern Area State & Private Forestry

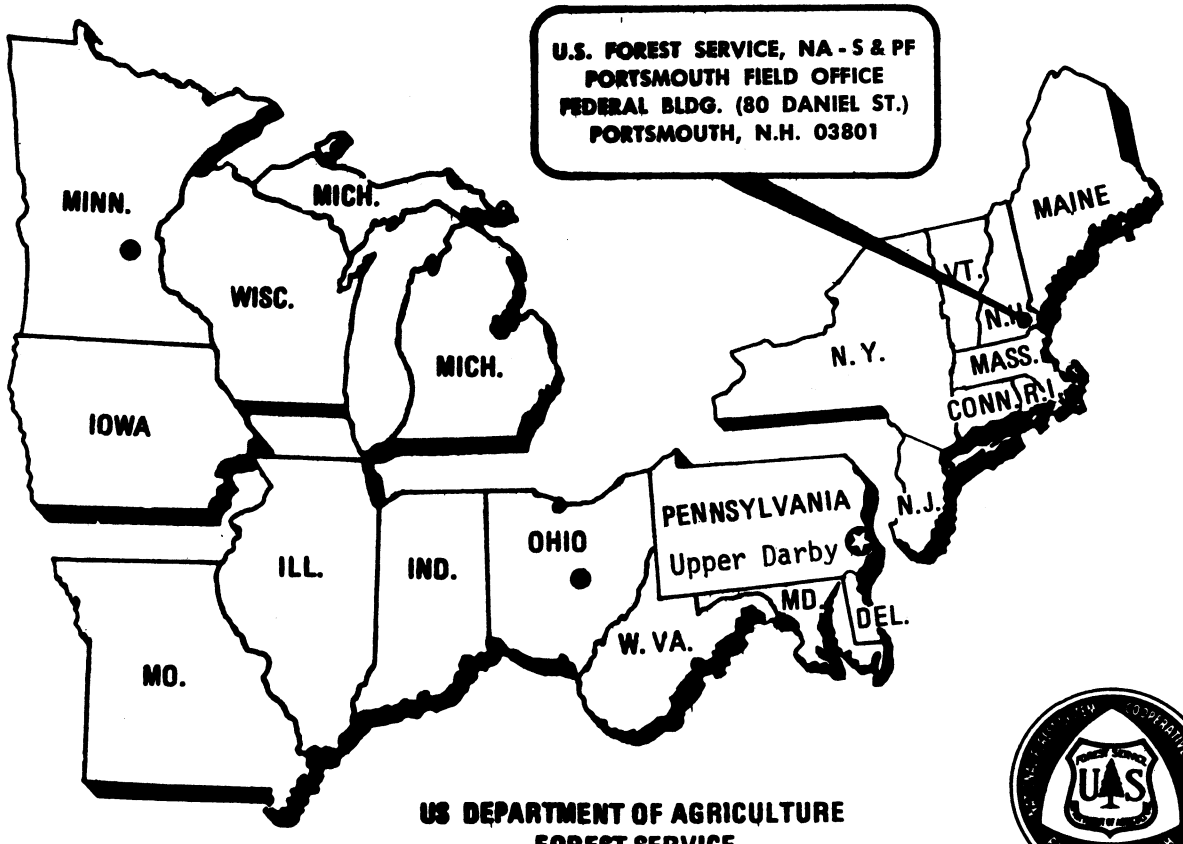
P-71-2

(R) 5240

RESULTS OF PILOT TEST OF MALATHION LOW VOLUME CONCENTRATE AGAINST LARCH SAWFLY, PRISTIPHORA ERICHSONII (HTG.) ON HECTOR LAND USE AREA, GREEN MOUNTAIN NATIONAL FOREST, NEW YORK

PARKER SNOWDEN
FOREST PEST CONTROL DIVISION

JUNE, 1971



US DEPARTMENT OF AGRICULTURE
FOREST SERVICE

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Results of Pilot Test of Malathion Low Volume(R) Concentrate Against Larch Sawfly, *Pristiphora erichsonii* (Htg.) on Hector Land Use Area, Green Mountain National Forest, New York.

by

Parker Snowden

Forest Pest Control Division

Forest Service

U.S.D.A.

ABSTRACT

In July 1970, a pilot test was conducted against the larch sawfly (Pristiphora erichsonii (Htg.)) on the Hector Land Use Area, Steamburg, N.Y., to protect larch stands which had been subjected to repeated infestations of this insect. Malathion (Premium Grade Cythion, 95% A.I.) was aerially applied with a fixed-wing aircraft on 2nd and 3rd instar larvae at the rate of 13 ounces per acre. Two treatments were necessary because larch sawfly adult emergence occurs over a prolonged period. The first treatment was applied June 23, 1970 at the peak of the third larval instar; the second treatment was applied July 17, 1970 to kill broods of the late emerging adults. Pre- and Post-spray larval surveys showed that each treatment reduced the existing larval population by 100 percent. Results of an egg deposition survey made on June 2, 1971, indicated that moderate defoliation will occur in the larch plantations during the summer of 1971. This is higher than expected. Contributing factors why defoliation will be moderate in these larch stands are stated in the report.

Introduction

The larch sawfly, Pristiphora erichsonni (Htg.), an introduced insect from Europe, is a destructive pest of tamarack and exotic species of Larix in North America. Although larch sawfly infestations are generally regulated by biotic factors, including predators, parasites, weather, competition for food, and oviposition sites, these factors occasionally fail to suppress outbreaks until after economic damage of larch takes place.

Evaluation of the sawfly population in Japanese larch plantations, Larix leptocepis (Sieb. & Zucc.) Gord., (about 100 acres) on the Hector Land Use Area, Steamburg, N.Y. during 1969 and early 1970 indicated severe defoliation and possibly appreciably tree mortality in 1970 if the plantations were left untreated. (6) A decision was made to suppress this insect with an insecticide, the objective being to protect the larch stands from further defoliation. A secondary purpose of the test was to provide additional information to facilitate registration of LV Malathion for suppression of this particular insect.

Investigations by Hanson (1968) showed that Malathion L.V.(R) Concentrate sprays effectively controlled the larch sawfly. (3). Based on Hanson's (3) investigation using low volume Malathion, we recommended the use of technical Malathion Low Volume (R) Concentrate applied twice at the rate of 13 fluid ounces per acre. The material and formulation was labeled under a U.S.D.A. temporary permit and was applied by fixed-wing aircraft in late June and early July, 1970. The operational phase of this test was conducted as an operational forest insect control project.

Mr. Paul Shaw, Forester, Hector Land Use Area, was the project leader and Mr. Parker Snowden, entomologist, Portsmouth Field Office, was technical advisor.

A view of a healthy larch stand on Plot #9 overlooking one of the ponds. This picture was taken after treatment. Defoliation is expected to be moderate in this section.

Test Area

The infestation was located in nine Japanese Larch plantations (approximately 100 acres) on the Hector Land Use Area, Green Mountain National Forest, in south-central New York near the town of Steamburg, N.Y. (Map 1) Temporary headquarters for the project were established at the Green Mountain National Forest Field Headquarters, Steamburg, New York.

There were no comparable larch stands on or in the vicinity of the Hector Land Use Area that could serve as a check area.

Spray Block Delineation

Since the larch plantations were contiguous and were self-delineating with respect to the surrounding timber, marking the plots was not difficult. (Map 2)

Seven references (50-foot clearing) adjacent to the plantations were marked with 30 X 3-foot crosses of asphalt roof tiles. Burnt Hill Road divided the plantation from north to south, so it was possible to use automobiles to delineate the northern and southern extremities of the spray area.

Two reconnaissance flights were flown several days prior to actual spraying to familiarize the spray pilot with the area. Wallace Merrill, Air Officer, NA-S&PF, Paul Shaw, Forester, John Maslack, Timber and Wildlife Management Staff, Green Mountain National Forest and Don Hatch, the spray pilot, participated in both flights. Maps and slides of the area were also used.

Pre- and Post-Spray Larval Samples

Eight trees were sampled in each of four randomly selected plots to determine sawfly reduction. Individual trees were identified with numbers painted blue and with blue flagging. Two thirty-inch branch terminals were collected for larval counts from each tree for the first application, and one thirty-inch branch terminal was collected for larval counts for the second application. Branch samples were taken and larval densities determined one to four days prior to first spray

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Twig curls caused by oviposition injury
(Arrows indicate twig curls)

application and four days after the second spray application.

Trees in the plantations were 40 - 60 feet tall and with high crowns. They were extremely difficult to sample. Those trees which could be most easily reached with a pole pruner equipped with a branch holder were selected for sampling. After the branch ends were selected and cut, and secured with the branch holder, they were dropped from 3 to 6 feet on a large muslin or plastic cloth which was held by two persons. Sample trees were well within the spray boundaries.

First Application --- Larval populations were determined by counting the larvae on two 30-inch branch terminals removed from each of 32 trees. The first spray was applied June 23, 1970 at the peak of the third instar. There was considerable overlapping of larval instars due to prolonged adult emergence.

Second Application --- Larval population were again determined by the same method as in the first application.

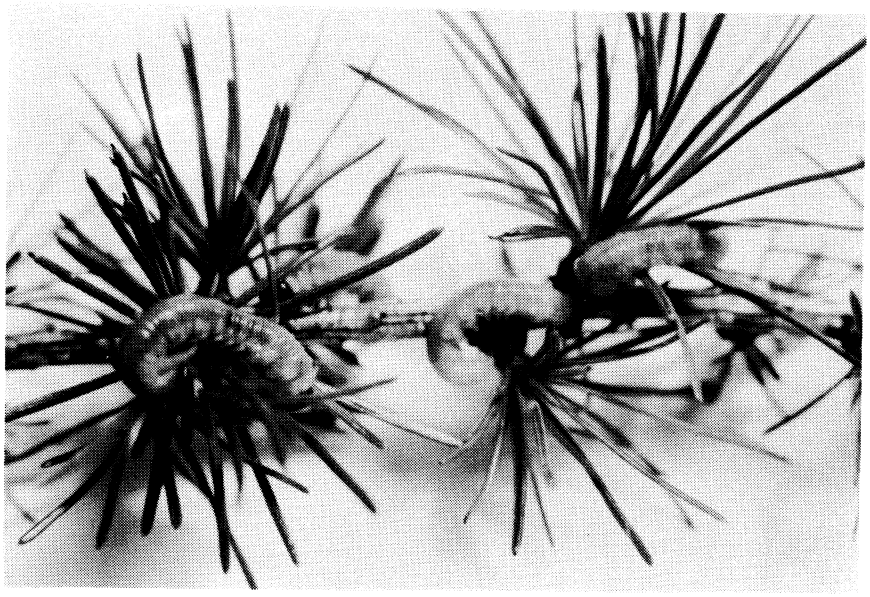
The second application was made on July 17, 23 days after the first application. It was timed to kill the brood of late emerging adults. Most of the larvae were in the third instar at the time of application.

Spray Deposit Determination

A total of 173 5" X 4" black sudan oil sensitive cards stapled on 6" X 6" plywood sheets were placed on the ground in openings near the sample trees and along trails, and roads. These cards were distributed ½ hour prior to spraying to determine spray coverage. They were picked up within 2 hours after spraying.

Drop Cloth

Twenty 3 X 3 -foot muslin drop cloths (five drop cloths for each four plantations) were used to catch larch



Fourth instar larvae on a larch twig

sawfly and other arthropods knocked down by the spray.

Cloths were fastened down at the corner with spike and placed under the tree canopy near sample trees. Dead and live larvae were counted and recorded twenty-four and forty-eight hours after spraying. (Tables 3 and 4)

Method of Treatment (Spray Equipment)

A Piper Super Cub fixed-wing aircraft was used for this project. This small, highly maneuverable fixed-wing aircraft was specifically recommended for this project for the purpose of gaining additional information on its operational efficiency and feasibility on small forest plantations.

The aircraft was calibrated at Ovid International Airport, Ovid, N. Y. the day prior to spraying. This operation was achieved by tieing a plastic bag on each nozzle and determining the amount of insecticide emmitted from the nozzles for one minute at 30-35 p.s.i.

The plane was equipped with ten #8001 and two #80015 flat fan nozzles with 100 mesh screens. It flew at an air speed of 85 m.p.h. at a spraying height of 20-30 feet above the canopy and with an effective swath of 70 feet. The plots were sprayed east to west except for a narrow strip in plot #4 which was sprayed north to south.

Meteorological Conditions

The first application was applied on June 23, 1970, at 5:45 a.m. and was completed at 6:45 a.m. The temperature was 55^{o}F and the wind was out of the south at 3 miles per hour. Ground conditions were dry with very little dew on the foliage. Although this area is generally windy in the morning, it was very calm and a perfect day for spraying.

After three consecutive days of cancelling out due to bad weather, the second application was finally applied on July 17, 1970 at 5:55 a.m. and was completed at 6:55 a.m. The temperature was 55^{o}F and the wind was out of the south at 3 miles per hour.

Chemical Used

Thirty gallons of technical Malathion Low Volume (R) Conc. were used during the entire operation. This insecticide, labeled under a U.S.D.A. temporary permit number 241, consisted of 95.0% active Malathion (Cythion - premium grade Malathion) and 5.0% inert ingredient. One gallon of this insecticide contained 9.7 lbs. of Malathion. The chemical name of this insecticide is O, O-Dimethyl Dithiophosphate of Diethyl Mercaptosuccinate. The application rate of each treatment was 13 fluid ounces of Malathion LV Concentrate. Thirteen fluid ounces LV Conc. contains 15.6 ounces avoirdupois of technical material.

This material, when used according to the manufacturer's specification, presents very little hazard to man and other warm-blooded animals or tetrapods. It is probably one of the safest of all the phosphatic insecticides. (5).

Insecticide which was not used after each application was drained from the aircraft and poured in a hole and covered with dirt to a depth of at least 18". The metal drums which contained the insecticide was rinsed with water and a detergent (½ cup + 3 gallons of water). The rinsing solution remained in the drum for 15 minutes and then was poured into a pit dug in soil. Several re-rinses were required.

Results

As a result of the first treatment, an estimated 100% reduction of the larval population present at the time of spraying was achieved. (Table 1). Results of the second treatment also indicated a 100% reduction of the larval population present at the time of application (Table 2). On the basis of total pre-spray larvae counted, the first application killed about 95% of the total larval population; the second application killed the remaining 5% of the total larval population.

The number of droplets per square inch on the deposit cards were counted with the aid of a binocular microscope, magnified 6X. Spray coverage as based on 64

spray deposit cards (16 per plot) laid on the ground for each application is shown in the following tabulation:

FIRST TREATMENT			SECOND TREATMENT		
Plots	No. of Spray Cards	Mean No. Droplets per square in.	Plots	No. of Spray Cards	Mean No. Droplets per square in.
4	16	1.64	4	16	20.55
6	16	15.42	6	16	9.68
7	16	7.10	7	16	43.10
9	16	15.41	9	16	17.76

The following information was obtained from spray deposit cards placed in other spray plots:

FIRST TREATMENT			SECOND TREATMENT		
Plots*	No. of Spray Cards	Mean No. Droplets per square in.	Plots	No. of Spray Cards	Mean No. Droplets per square in.
5*	10	32.33	5	10	18.53
4*	0	---	4	3	8.99
1***	2	16.0	1	2	2.66
2***	2	12.0	2	1	6.0
8**	6	0.88	8	6	12.33
9*	0	---	9	2	10.99

No spray cards were laid in Plot #3.

* On trails
** On road
*** On plantation

Spray droplet size was not determined in this pilot test.

As indicated in Tables 3 and 4, the number of dead larvae collected on the drop cloths after 48 hours were reduced considerably than those collected in 24 hours. No live larvae were found 48 hours after first application, and none 24 and 48 hours after the 2nd application.

Estimate of Suppression Effectiveness

A survey of the plantation was made June 2 - 3, 1971 to determine the amount of egg deposition of larch sawfly following treatment.

Based on the examination of approximately 400 shoots utilized for oviposition using the system devised by Ives and Prentice (2), moderate defoliation will occur in Plots #1 through 8. In Plot #9, evidence indicates that the degree of defoliation will range from moderate to severe.

We learned from the spray pilot after the second application was applied in July 1970, that there were a few trees in the northeast corner of Plot #9 which were severely defoliated. In ground checking this area, we found approximately 20 - 30 trees completely defoliated. Many live cocoons were also found throughout this small area (approx. 2 - 3 acres). Taking extra precautionary measures not to spray any portion of private land abutting Plot #9 may have resulted in this area being lightly sprayed or perhaps missed. Thus, larch sawfly adults from this area in Plot #9 could have re-invaded the other plots after successful control was obtained in 1970. Although corner markers might have served as a reference point to delineate this area for the pilot, it was considered to be unsafe, due to many existing cellar holes.

Other contributing factors why the degree of infestation following treatment was higher than expected are as follows:

1. Although these insects normally have one generation a year, second generation adults do occur some years (never exceeds 2% of the total emergence) (1 & 2). Thus, second generation adults may have occurred in this plantation.

Larch sawfly adult resting on a twig

2. Probably invasion of adult sawflies from infested areas outside of the test area might have occurred.

3. Probably a small percentage of the prepuape passed the winter of 1970 in diapause. According to Graham (2) and Drooz (1), 4/5% of the prepupae live over two winters, and less than 2% pass the third winter in diapause. They also stated that it is common among many sawflies to remain in diapause for two or more years. There is suggestion that prolonged diapause is related to low summer temperature. (1)

4. Probably parasitic and predatory activities were reduced to a minimum due to the area being sprayed.

A follow-up survey will be conducted the latter half of June 1971 to determine the larval population levels and intensity of defoliation.

Monitor the Environment for Adverse Effects

Adverse effects on the natural habitat appeared negligible. No noticeable mortality was observed on aquatic insect or fish in the two ponds in the spray area. Polliwogs which were constantly seen in many depressions throughout the entire area were not effected during the spray operation.

Since no dead birds were found in the spray area, it is presumed that no significant bird kill occurred as a result of the two Malathion spray applications.

Spraying these trees not only saved these larch stands from further defoliation by the larch sawfly, but also enhanced timber growth and value in order to protect our environment.

Discussion

Since it was the intent to spray the entire 105 acres of larch, no comparable larch stand on or in the vicinity of Hector Land Use Area could be utilized as a check area. However, the time span between pre-spray sampling and the application of the insecticide was so short that a sudden catastrophic collapse of the larval population would have been unlikely. A check area would have provided little pertinent information in this particular situation.

Larvae were recorded in the field to save the time and effort of bringing them back to the laboratory. The larvae were large enough to obtain an accurate count. Besides, transporting these larval samples back to the laboratory might have enhanced the possibility of mutilating them in the bag or losing them enroute to the laboratory.

A total of 21 parasitic insects were collected on the 20 drop cloths after the 1st application of Malathion. Three parasites were collected after the 2nd application. Of the total, 17 were Hymenopterous adult wasps (4 Braconids, 7 Ichneumonids, 1 Eulophids, 1 Chalcids, and 2 Pteromalids), and seven Tachinid adults. Fifteen predators were also collected on the 20 drop cloths after the 1st application.

Since few Hymenopterous and Tachinid parasites and mostly Coleopterous and Hemipterous predators were collected from the drop cloths after the second application, no counts were recorded. (Table 5)

Although no specimens were identified as larch sawfly parasites, these insects will be sent to the Insect Identification and Parasite Introduction Research Division, Beltsville, Maryland for positive identification.

References

1/ Drooz, A. T. 1960. The Larch Sawfly, Its Biology and Control. Technical Bulletin No. 1212, Forest Service, U.S. Department Agriculture.

2/ Graham, Samuel. 1956. The Larch Sawfly in the Lake States. Forest Science, Volume 2.

3/ Hanson, J.B. 1968, Larch Sawfly Suppression with Malathion LV (R) Concentrate. Jour. Economic Entomol. 61(3): 872.

4/ Ives, W. C. H. & R.M. Prentice. 1958. A Sequential Sampling Technique for surveys of the Larch Sawfly. Can. Ent. Vol. XC. No. 6.

5/ Northeastern Regional Pesticide Coordinators. 1966. Northeast Pesticide Information Manual.

6/ Snowden, P. and D. Wieczorck. 1969. Evaluation of Larch Sawfly (Pristiphora erichsonii (Htg.) on Hector Land Use Area, New York Utilizing Egg Deposition Sites. NA-S&PF Portsmouth Field Office, Report No. A-69-3.

TABLE 1

PRE-SPRAY & POST SPRAY LARVAL COUNTS - 1st APPLICATION
BASED ON 30" BRANCH
SEGMENTS

PRE-SPRAY (1-4 days before treatment)				POST SPRAY (4 days after treatment)			
Tree No.	Date Sampled	No.. Branches	No. of Living Larvae	Tree No.	Date Sampled	No. Branches	No. of Living Larvae
40	6/22/70	2	144	40	6/27/70	2	0
41	6/22/70	2	160	41	6/27/70	2	0
42	6/22/70	2	41	42	6/27/70	2	0
43	6/22/70	2	14	43	6/27/70	2	0
44	6/22/70	2	74	44	6/27/70	2	0
45	6/22/70	2	295	45	6/27/70	2	0
46	6/22/70	2	310	46	6/27/70	2	0
47	6/22/70	2	58	47	6/27/70	2	0
60	6/18/70	2	125	60	2/27/70	2	0
61	6/18/70	2	17	61	2/27/70	2	0
62	6/18/70	2	75	62	2/27/70	2	0
63	6/18/70	2	58	63	2/27/70	2	0
64	6/18/70	2	18	64	2/27/70	2	0
65	6/18/70	2	102	65	2/27/70	2	0
66	6/18/70	2	66	66	2/27/70	2	0
67	6/18/70	2	187	67	2/27/70	2	0
70	6/18/70	2	51	70	2/27/70	2	0
71	6/18/70	2	275	71	2/27/70	2	0
72	6/18/70	2	184	72	2/27/70	2	0
73	6/18/70	2	146	73	2/27/70	2	0
74	6/18/70	2	77	74	2/27/70	2	0
75	6/18/70	2	89	75	2/27/70	2	0
76	6/18/70	2	63	76	2/27/70	2	0
77	6/18/70	2	60	77	2/27/70	2	0
90	6/22/70	2	102	90	2/27/70	2	0
91	6/22/70	2	173	91	2/27/70	2	0
92	6/22/70	2	63	92	2/27/70	2	0
93	6/22/70	2	174	93	2/27/70	2	0
94	6/22/70	2	214	94	2/27/70	2	0
95	6/22/70	2	361	95	2/27/70	2	0
96	6/22/70	2	90	96	2/27/70	2	0
97	6/22/70	2	106	97	2/27/70	2	0
	TOTALS	64	3972		TOTALS	64	0

TABLE 2

PRE SPRAY AND POST SPRAY LARVAL COUNTS - 2nd APPLICATION
(BASED ON 30 BRANCH SEGMENTS)

PRE-SPRAY (1-2 days before treatment)				POST SPRAY (4 days after treatment)			
Tree No.	Date Sampled	No. Branches	No. of Living Larvae	Tree No.	Date Sampled	No. of Branches	No. of Living Larvae
40	7/9/70	1	0	40	7/21/70	1	0
41	7/9/70	1	0	41	7/21/70	1	0
42	7/9/70	1	0	42	7/21/70	1	0
43	7/9/70	1	0	43	7/21/70	1	0
44	7/9/70	1	1	44	7/21/70	1	0
45	7/9/70	1	0	45	7/21/70	1	0
46	7/9/70	1	0	46	7/21/70	1	0
47	7/9/70	1	0	47	7/21/70	1	0
60	7/9/70	1	3	60	7/21/70	1	0
61	7/9/70	1	0	61	7/21/70	1	0
62	7/8/70	1	0	62	7/21/70	1	0
63	7/9/70	1	0	63	7/21/70	1	0
64	7/8/70	1	42	64	7/21/70	1	0
65	7/8/70	1	8	65	7/21/70	1	0
66	7/9/70	1	0	66	7/21/70	1	0
67	7/9/70	1	20	67	7/21/70	1	0
70	7/9/70	1	8	70	7/21/70	1	0
71	7/9/70	1	1	71	7/21/70	1	0
72	7/9/70	1	0	72	7/21/70	1	0
73	7/9/70	1	11	73	7/21/70	1	0
74	7/9/70	1	18	74	7/21/70	1	0
75	7/9/70	1	34	75	7/21/70	1	0
76	7/9/70	1	2	76	7/21/70	1	0
77	7/9/70	1	0	77	7/21/70	1	0
90	7/9/70	1	8	90	7/21/70	1	0
91	7/9/70	1	9	91	7/21/70	1	0
92	7/9/70	1	0	92	7/21/70	1	0
93	7/9/70	1	2	93	7/21/70	1	0
94	7/9/70	1	0	94	7/21/70	1	0
95	7/9/70	1	13	95	7/21/70	1	0
96	7/9/70	1	7	96	7/21/70	1	0
97	7/9/70	1	8	97	7/21/70	1	0
	TOTAL	32	195			32	0

TABLE 3

TREATMENT EFFECTIVENESS OF MALATHION USING DROP CLOTHS (PRISTIPHORA ERICHSONII)

JUNE 23, 1970

PLANTATION NO.	DROP CLOTH NO.	DATE TREATED	NO.OF DEAD LARVAE AFTER 24 HOURS	NO.OF LIVE LARVAE AFTER 24 HOURS	NO.OF DEAD LARVAE AFTER 48 HOURS	NO.OF LIVE LARVAE AFTER 48 HOURS
4	1	6/23/70	100	16	33	0
4	2	6/23/70	212	7	88	0
4	3	6/23/70	201	0	3	0
4	4	6/23/70	259	0	3	0
4	5	6/23/70	188	0	17	0
6	1	6/23/70	208	0	4	0
6	2	6/23/70	289	0	8	0
6	3	6/23/70	314	0	4	0
6	4	6/23/70	329	0	10	0
6	5	6/23/70	396	0	8	0
7	1	6/23/70	468	0	4	0
7	2	6/23/70	334	0	7	0
7	3	6/23/70	318	0	4	0
7	4	6/23/70	304	0	6	0
7	5	6/23/70	773	0	8	0
9	1	6/23/70	310	0	5	0
9	2	6/23/70	353	0	11	0
9	3	6/23/70	121	0	2	0
9	4	6/23/70	506	0	5	0
9	5	6/23/70	350	0	2	0
			6333	23	232	0

TABLE 4

TREATMENT EFFECTIVENESS OF MALATHION USING DROP CLOTHS (PRISTIPHORA ERICHSONII)

JULY 17, 1970

PLANTATION NO.	DROP CLOTH NO.	DATE TREATED	NO.OF DEAD LARVAE AFTER 24 HOURS	NO.OF LIVE LARVAE AFTER 24 HOURS	NO.OF DEAD LARVAE AFTER 48HOURS	NO.OF LIVE LARVAE AFTER 48 HOURS
4	1	7/17/70	15	0	5	0
4	2	7/17/70	4	0	5	0
4	3	7/17/70	1	0	4	0
4	4	7/17/70	7	0	15	0
4	5	7/17/70	2	0	4	0
6	1	7/17/70	39	0	10	0
6	2	7/17/70	1*	0	1	0
6	3	7/17/70	7	0	5	0
6	4	7/17/70	9*	0	17	0
6	5	7/17/70	11	0	7	0
7	1	7/17/70	107	0	21	0
7	2	7/17/70	33	0	18	0
7	3	7/17/70	15	0	3	0
7	4	7/17/70	16	0	4	0
7	5	7/17/70	3	0	0	0
9	1	7/17/70	8	0	4	0
9	2	7/17/70	33	0	17	0
9	3	7/17/70	21	0	4	0
9	4	7/17/70	11	0	7	0
9	5	7/17/70	31	0	2	0
			374	0	153	0

* Cloth blown over or disturbed?

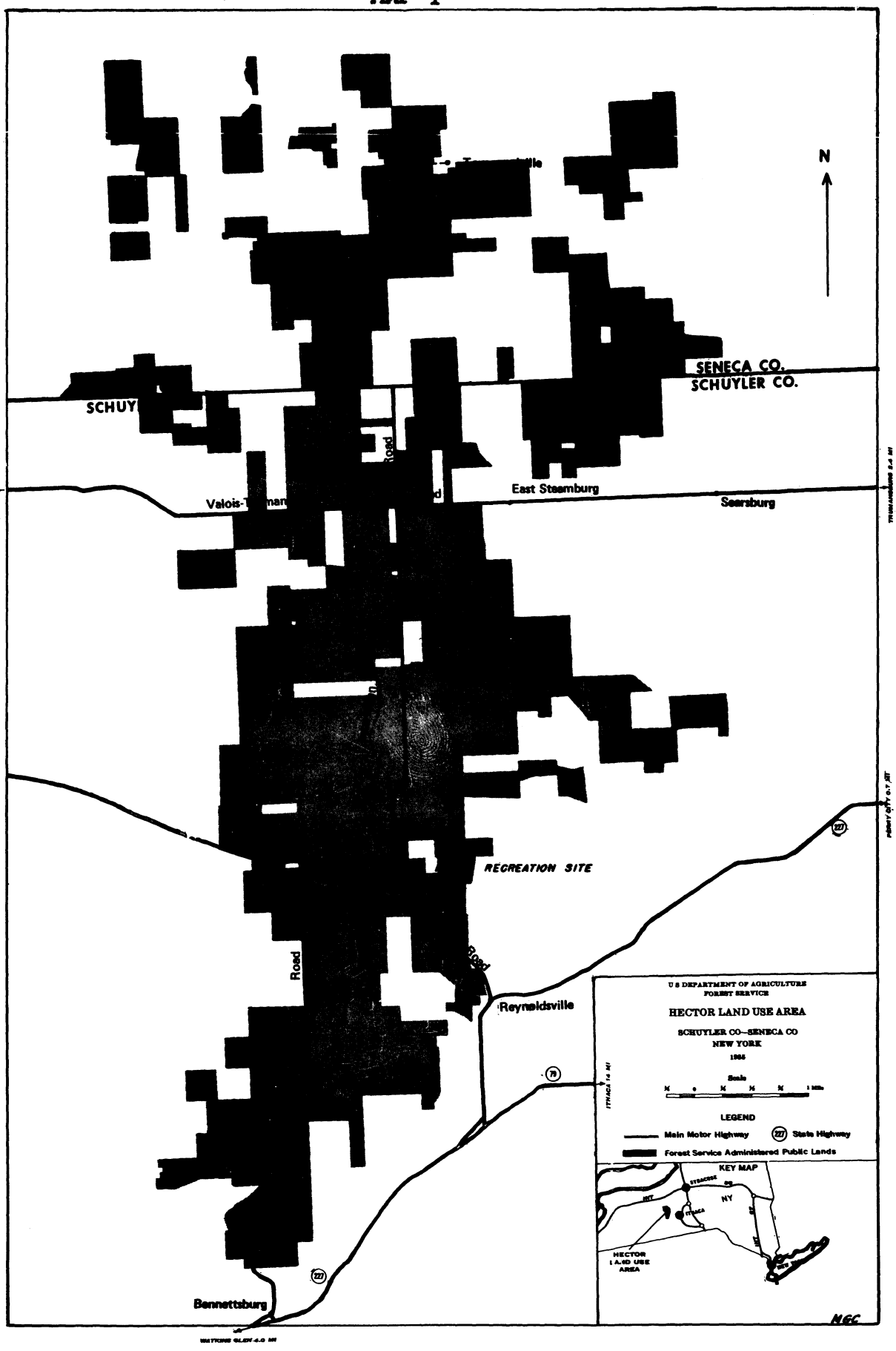
TABLE 5

NUMBERS OF PARASITIC HYMENOPTERA AND DIPTERA COLLECTED ON 20 DROP-CLOTHS AFTER 1st APPLICATION OF MALATHION

1st APPLICATION				
Drop Cloth No.	24 Hrs Hymen.	& Dipt.	48 Hrs Hymen.	& Dipt.
4.1	0	0	0	0
4.2	0	0	0	0
4.3	0	0	0	0
4.4	0	0	0	0
4.5	0	0	0	0
6.1	2	0	0	0
6.2	2	0	0	1
6.3	2	0	0	0
6.4	2	0	0	0
6.5	0	0	0	0
7.1	0	0	0	0
7.2	0	0	0	0
7.3	1	0	0	0
7.4	0	0	0	0
7.5	1	0	0	0
9.1	0	0	0	0
9.2	0	0	0	0
9.3	2	4	0	0
9.4	3	1	1	0
9.5	0	1	0	1
Total	15	6	1	2

5 unidentified parasites collected 24 hours after 1st application
2 unidentified parasites colledted 48 hours after 1st application
15 unidentified predators collected 24 hours after 1st application
0 predators collected 48 hours after 1st application

MAP 1


N
SENECA CO.
SCHUYLER CO.
SCHUY
East Steamburg
Searsburg
Valois-T
Road
RECREATION SITE
Road
Reynoldsville
Bennettsburg
227
79
U S DEPARTMENT OF AGRICULTURE
FOREST SERVICE
HECTOR LAND USE AREA
SCHUYLER CO—SENECA CO
NEW YORK
1956
Scale
LEGEND
Main Motor Highway
State Highway
Forest Service Administered Public Lands
KEY MAP
NY
HECTOR
L A ND USE
AREA
MGC

MAP 2

LARCH PLANTATION HECTOR LAND USE AREA
GREEN MOUNTAIN NATIONAL FOREST
STEAMBURG, NEW YORK